A BLUFFER'S GUIDE TO TARGETING AND WEAPONEERING

LT COL JEFF WALKER

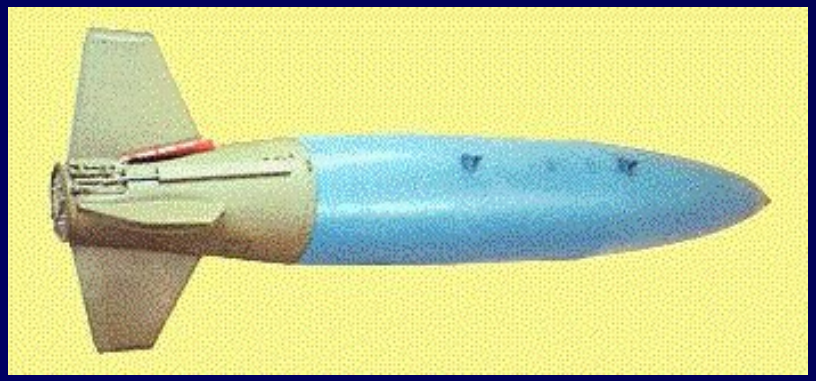
INTERNATIONAL & OPERATIONS LAW DIVISION
HEADQUARTERS AIR FORCE

THIS BRIEFING IS

TARGETING & WEAPONEERING

- Munitions Familiarization
- LOAC Related To Targeting
- Weaponeering Concepts
- Targeting Process
- Collateral Damage Assessment

MUNITIONS FAMILIARIZATION



- **Two Types of Munitions**
  - Guided and Unguided

“Smart Bombs and Dumb Bombs”

MUNITIONS FAMILIARIZATION

UNGUIDED MUNITIONS

MK- 82 (AIR)	500lb (High/Low Drag)
MK- 84 (AIR)	2000lb (High/Low Drag)
BLU - 109	2200lb (Penetration Weapon)
BLU- 82	15,000lb (Daisy Cutter)
CBU-87/89	Cluster Bombs

Mk80 Family of Bombs

Mk81

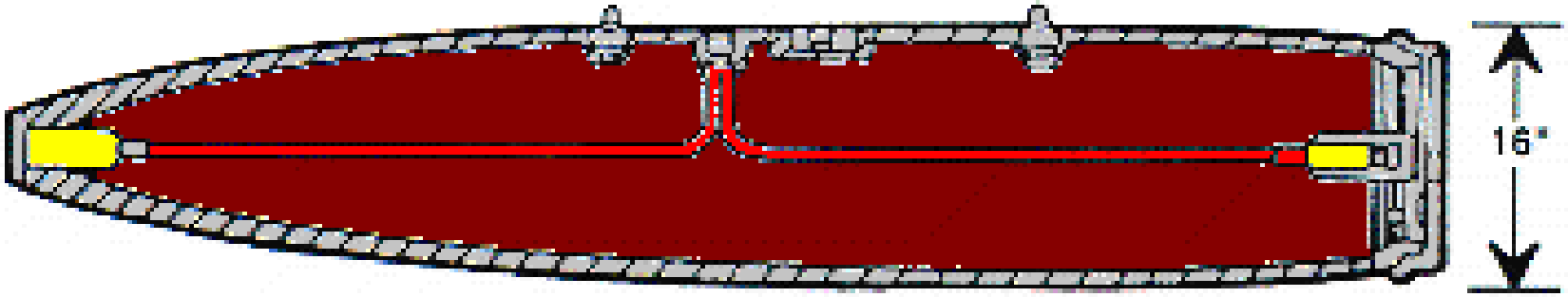
Mk82

Mk83

Mk84

WARHEAD COMPARISONS

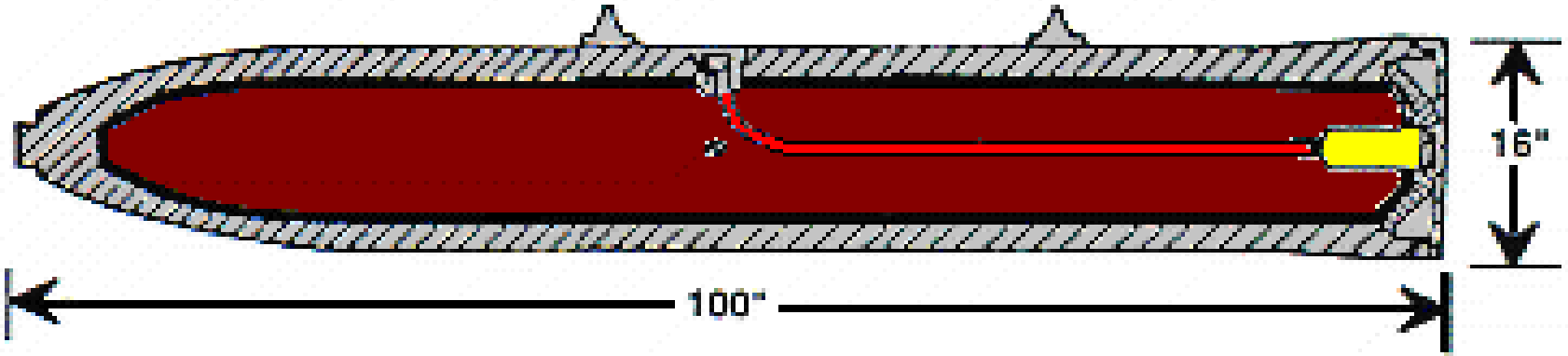
MK-84



TOTAL WEIGHT = 1902 lbs
(863.5 kg)

EXPLOSIVE WEIGHT = 965 lbs TRITONAL
(438.0 kg)

BLU-109 / B

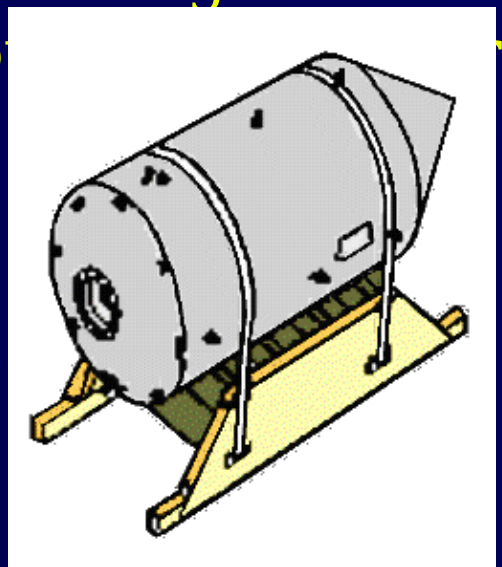


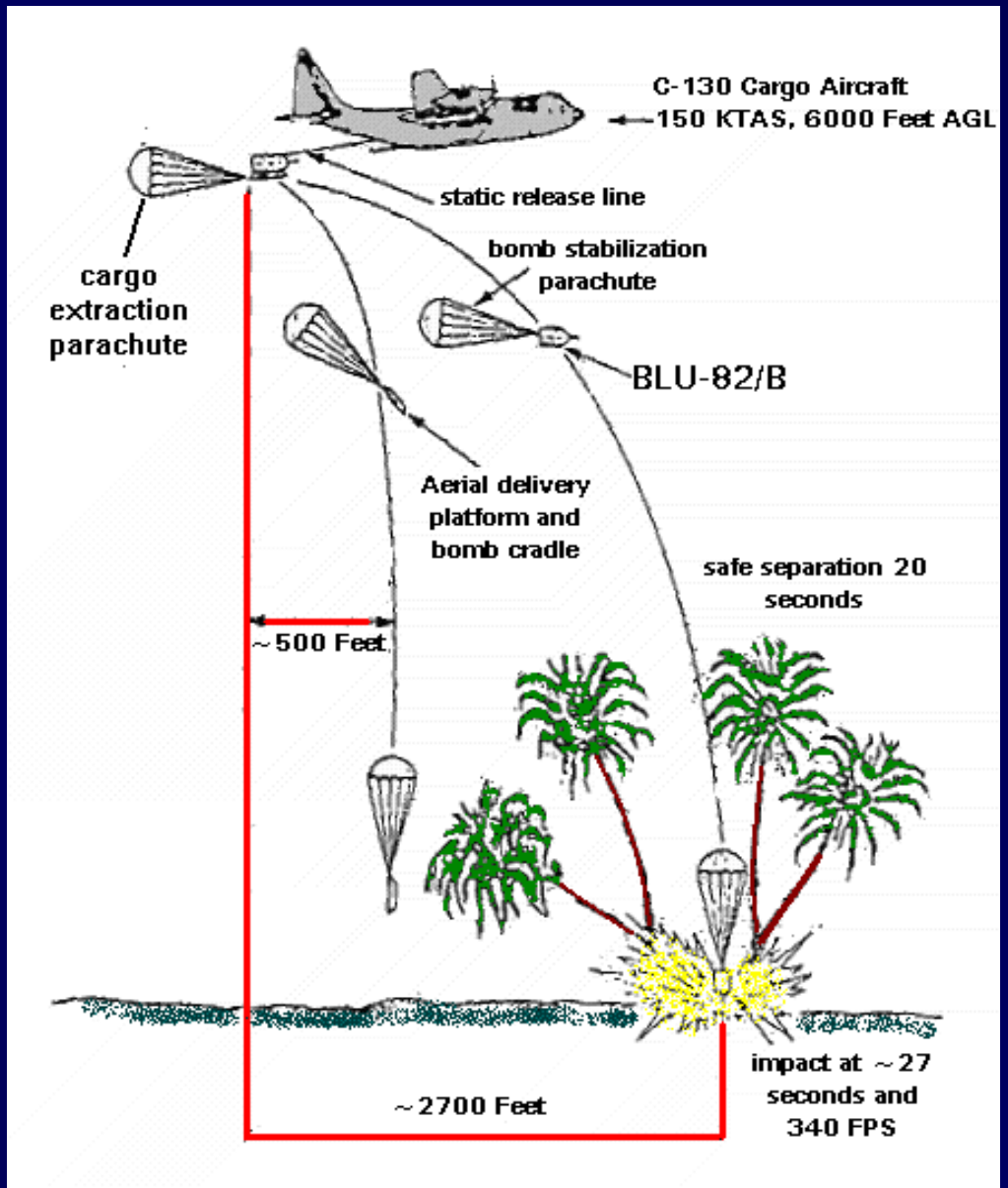
TOTAL WEIGHT = 1967 lbs
(893.0 kg)

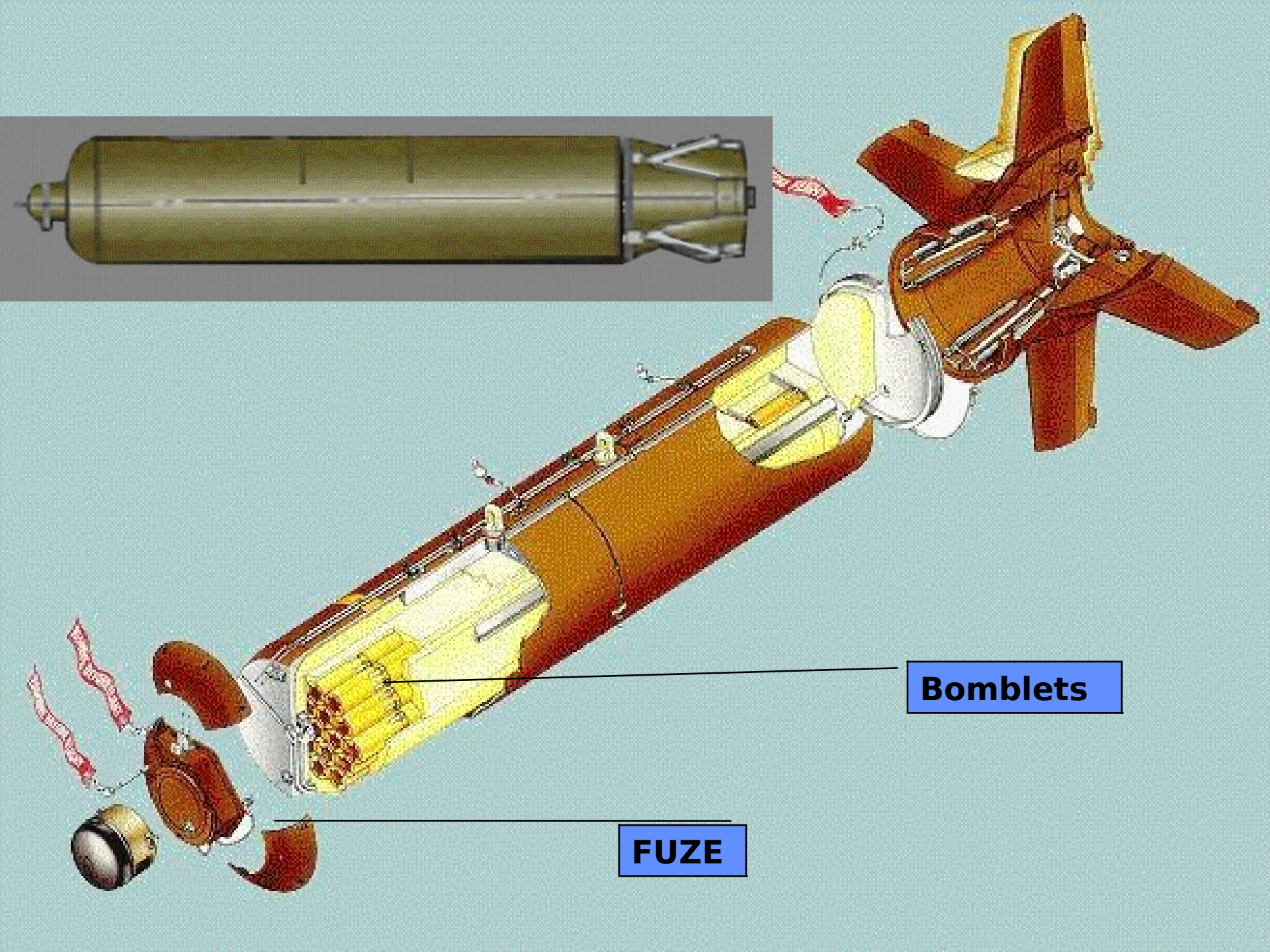
EXPLOSIVE WEIGHT = 535 lbs AFX 706
(242.9 kg)

BLAST UNIT - 82
BLU-82

The BLU-82B/C-130 weapon system, nicknamed Commando Vault, is the high altitude delivery of a 15,000 pound general p om a






Bomblets
FUZE

MUNITIONS FAMILIARIZATION

PRECISION GUIDED MUNITIONS (PGMs)
Methods of Guidance

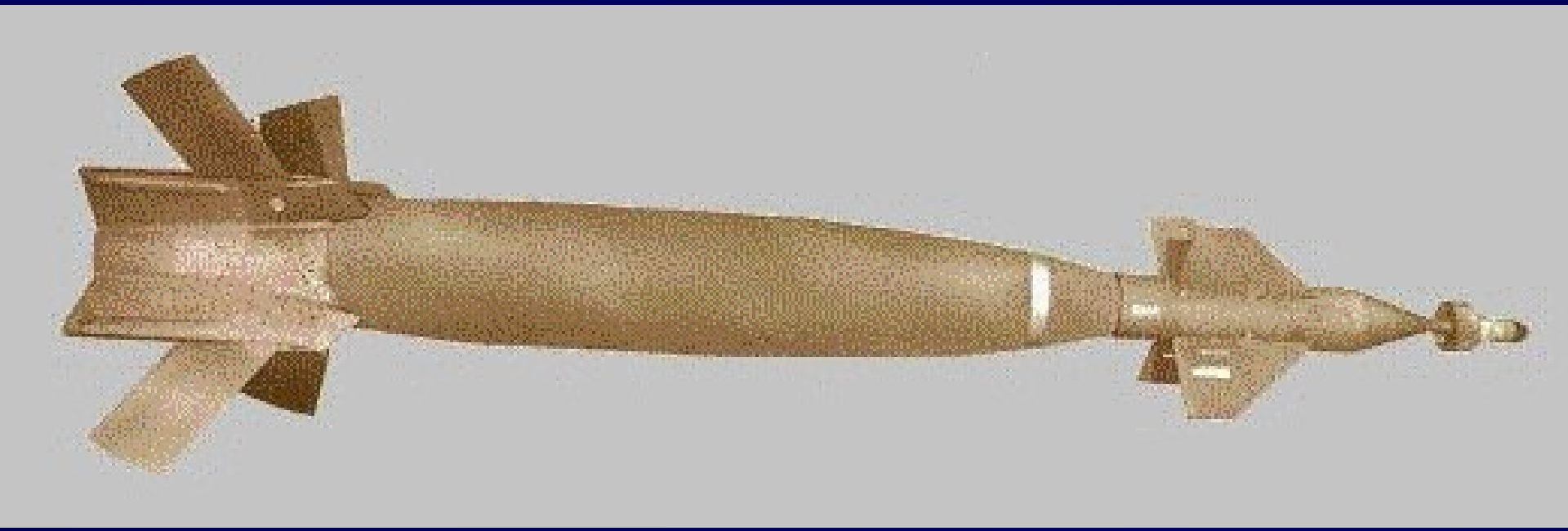
- **Laser Guided (LGB)**
  - Paveway I, II, III
- **TV Guided**
  - Video Display in cockpit
- **Internal Navigation with GPS**
  - Terrain Reading or Longitude/Latitude

MUNITIONS FAMILIARIZATION

TYPES OF GUIDED BOMBS

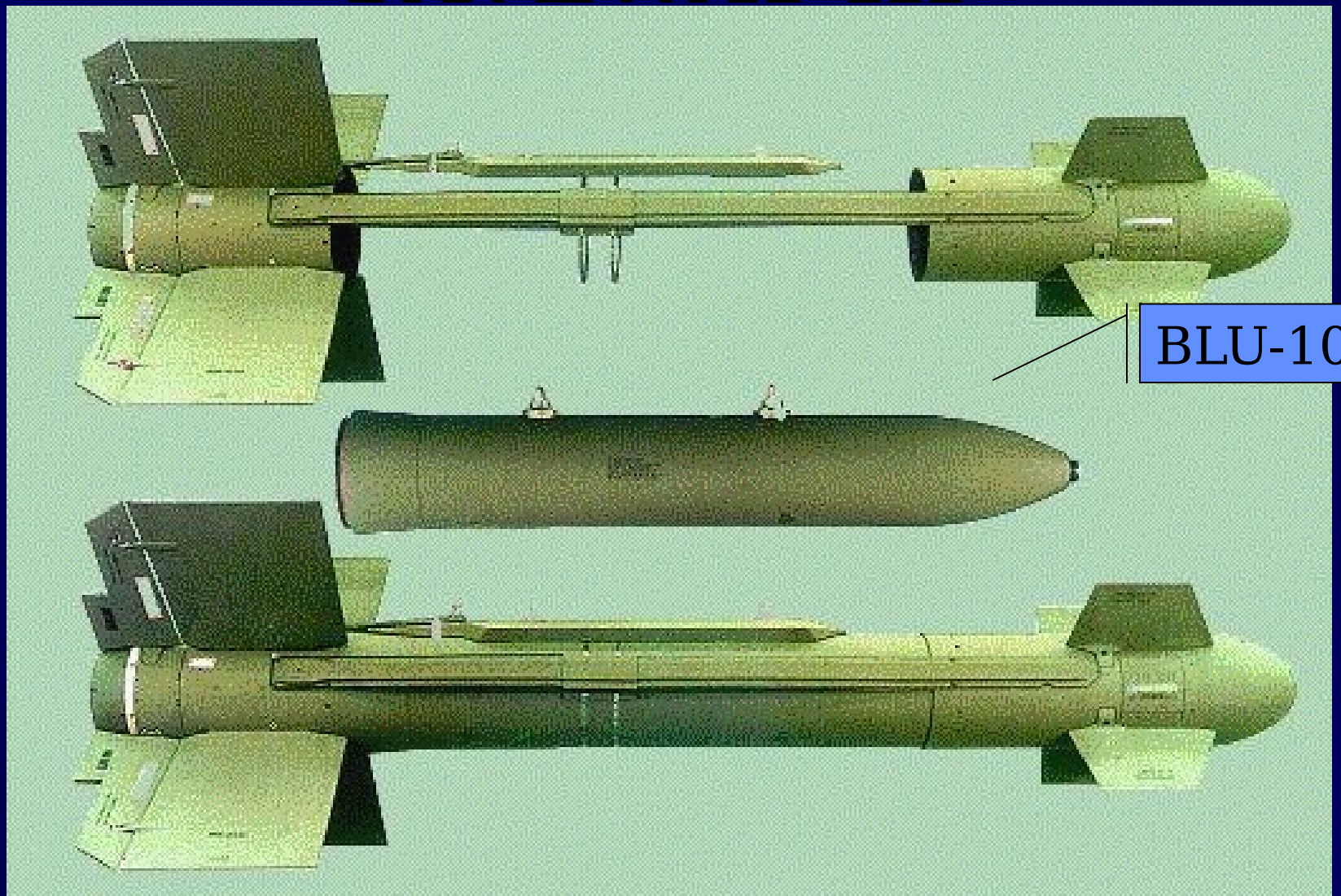
- **Guided Bomb Units (GBU)**
  - **GBU - 10 2000lb LGB (MK- 84/Paveway I, II)**
  - **GBU - 12 500lb LGB (MK-82/ Paveway I, II)**
  - **GBU - 15 2000lb TV/IR (MK-84/BLU-109)**
  - **GBU - 24 2200lb LGB (BLU - 109/Paveway III)**
  - **GBU - 27 2200lb LGB (BLU - 109/Paveway III)**
  - **GBU - 31 2200lb LGB (BLU - 109/Paveway III)**

GUIDED BOMB UNIT-10 (GBU-10) PAVEWAY II

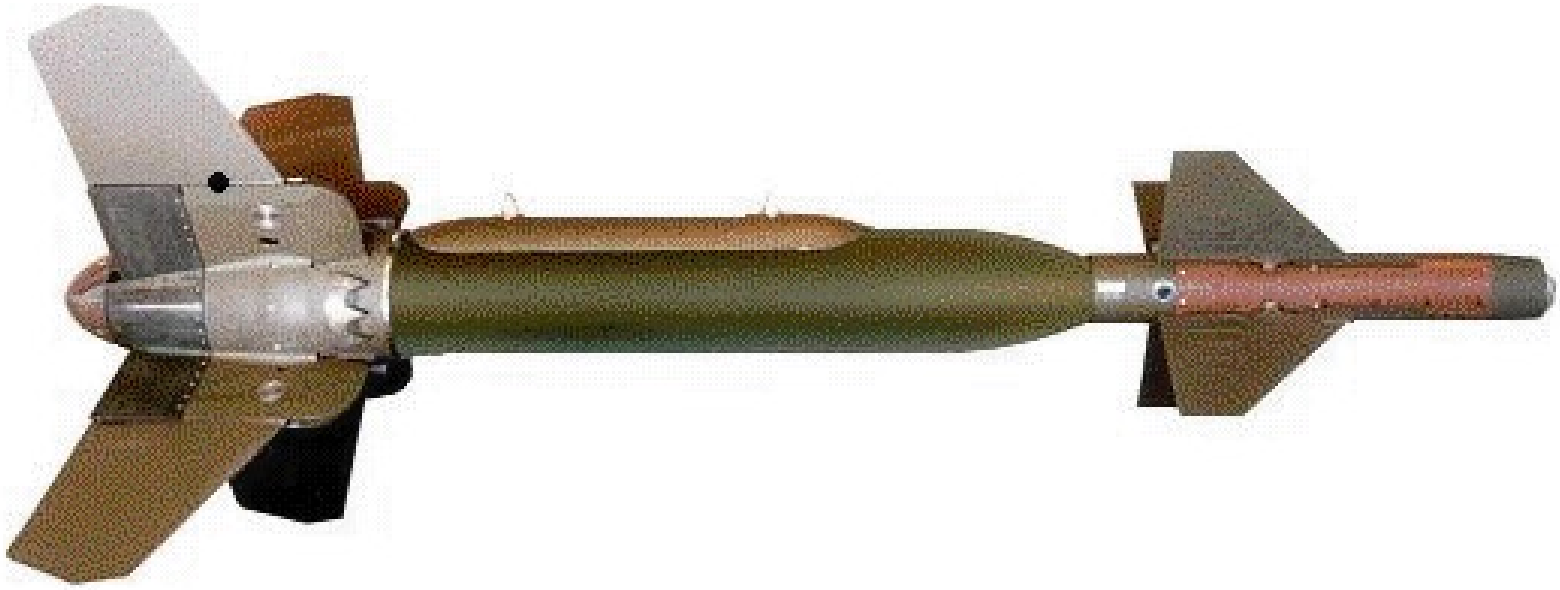


GUIDED BOMB UNIT-12 (GBU-12) PAVEWAY II

GUIDED BOMB UNIT-15 (GBU-15) PAVEWAY III



GUIDED BOMB UNIT-24 (GBU-24) PAVEWAY III



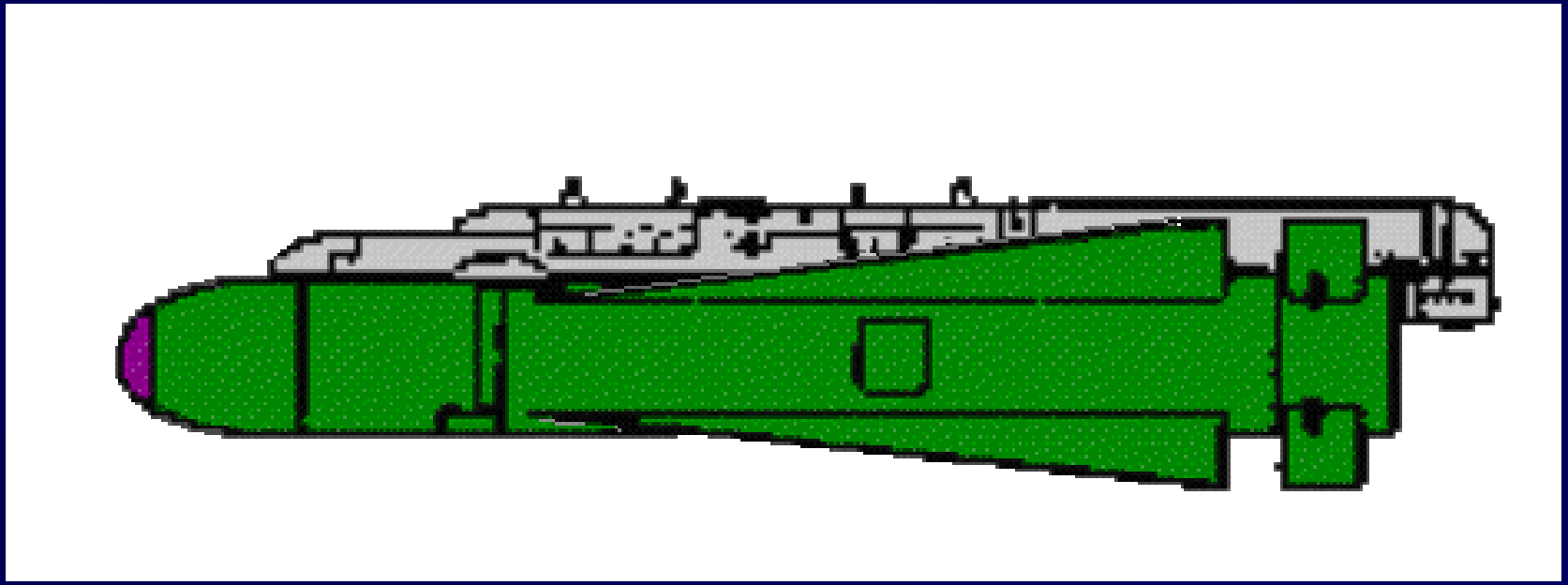
GUIDED BOMB UNIT-27 (GBU-27) PAVEWAY III

PRECISION GUIDED MUNITIONS PGMs

- **TV Guided Munitions**
  - **- AGM 65 A-G** **TV/IR Guided**
  - **- AGM 130** **GBU-15 with Rocket Propulsion**

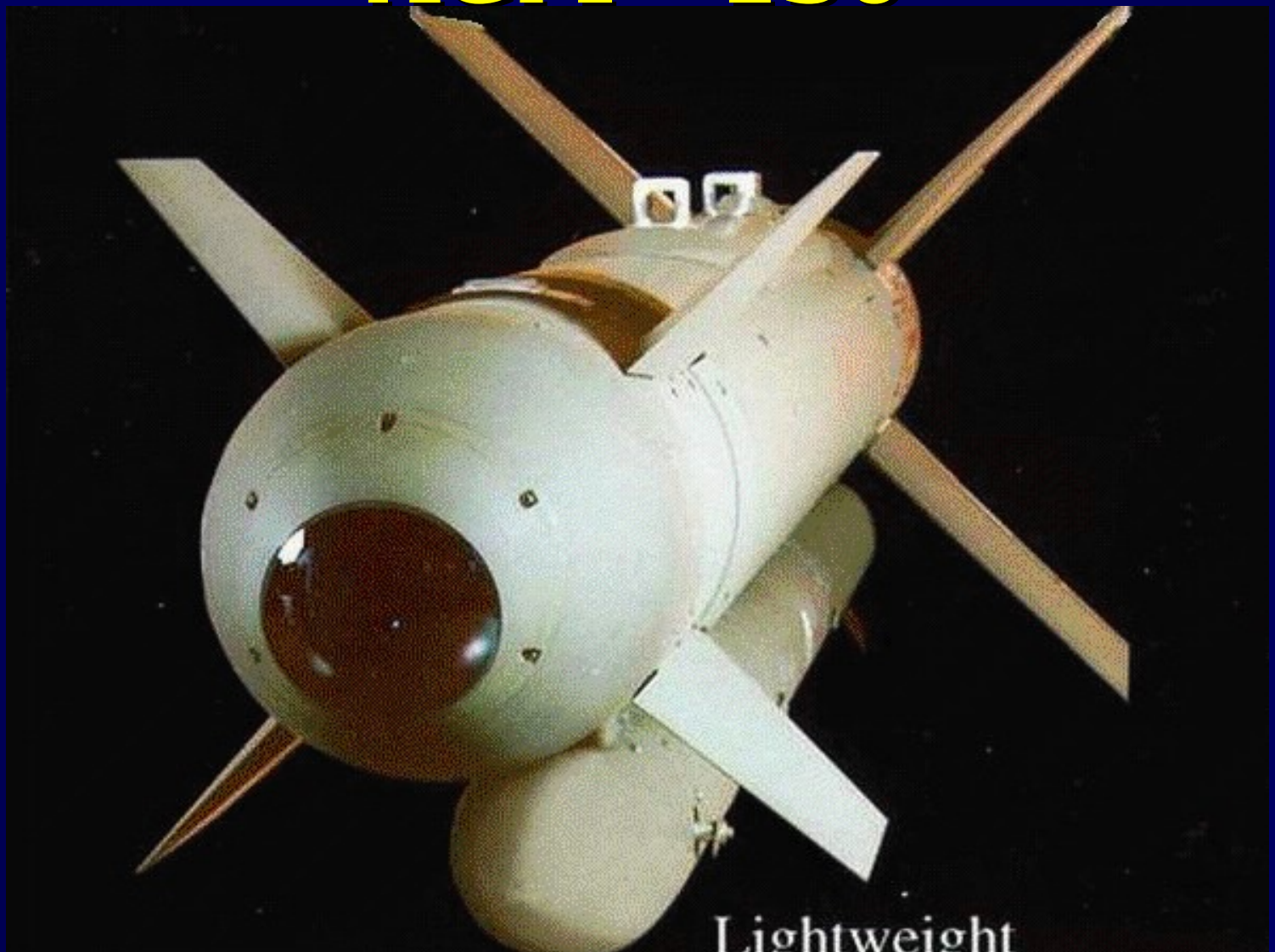
- **Internal Navigation Munitions**
  - **- Conventional Air Launched Cruise Missile (CALCM)**
  - **- Tomahawk Land Attack Missle (TLAM)**

AIR TO GROUND MISSLE AGM - 65



AGM - 65 SHOT

AIR TO GROUND MISSLE AGM - 130



Conventional Air Launched Cruise Missle CACLM

CALCM Evolution

Baseline CALCM (Block 0)

- 1st generation GPS
- Blast/frag warhead

105 missiles converted by 1994

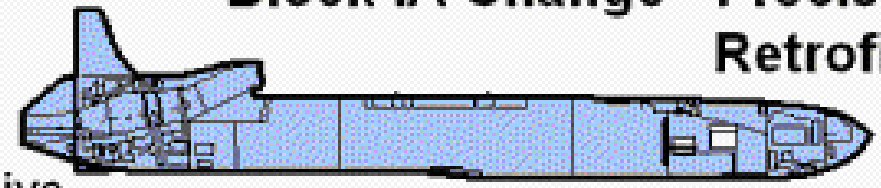
Block I Change - Improved CALCM

- 2nd generation GPS
- Improved accuracy
- Improved blast/frag
- Producibility improvements

200 missiles converted by Dec 1997

Block IA Change - Precision Accuracy Retrofit

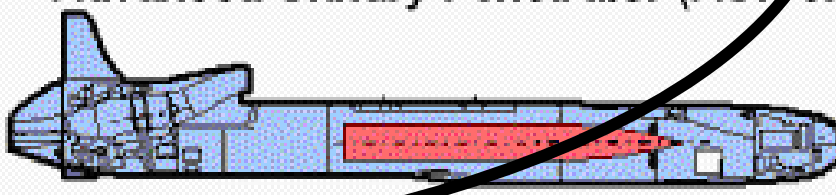
- 3rd generation GPS
- Precision strike accuracy
- High GPS anti-jam
- Current or steep terminal dive



163 missiles retrofitted by mid 2001

Block II Change - Hard Target Capability

- 3rd generation GPS with Precision strike accuracy and High GPS anti-jam
- Multiple Warhead System (MWS) or Advanced Unitary Penetrator (AUP-3I



85 missile conversions by mid-02 and 110 additional by '03

LAW OF ARMED CONFLICT (LOAC) PRINCIPLES

- **MILITARY NECESSITY - Legitimate military need to use force**
- **PROPORTIONALITY - Damage vs. military advantage**
- **COLLATERAL DAMAGE - Minimize!**
- **UNNECESSARY SUFFERING - Avoid**

LOAC TARGETING PRINCIPLES

- Can Target Military Objectives
  - Combatants
  - Objects which contribute to military action
- Ordinarily Cannot Target
  - Civilians
  - Non-combatants (e. g., medics, chaplains, sick, wounded, & parachutists)
  - Protected places (e.g., churches & monuments)
  - Undefended places (open population centers)

WEAPONEERING

- **What is it?**

  - A process of determining the quantity of force required to achieve a specific level of damage

- **Weaponeering Objective**

  - Get the most “bang” for the buck with the least amount of risk to personnel and equipment

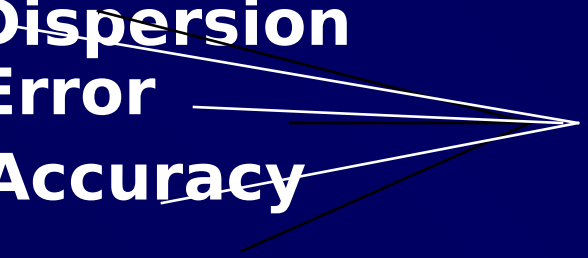
WEAPONEERING Fundamentals

- **JOINT MUNITIONS EFFECTIVENESS MANUAL**
  - **JMEMs Weaponeers Guide**

- **COMPONENTS OF WEAPONEERING**
  - **Accuracy Measures**
  - **Probability of Damage**
  - **Error Types**

WEAPONEERING
Accuracy Measures

- **FACTORS THAT AFFECT ACCURACY**
  - **-Aiming Error**
  - **-Ballistic Dispersion**
  - **Bombing Error**
  - **-Delivery Accuracy**



WEAPONEERING CONCEPTS

- **PROBABILITY OF DAMAGE (PD)**

- The mathematical assessment of damage calculated with the factors that affect accuracy

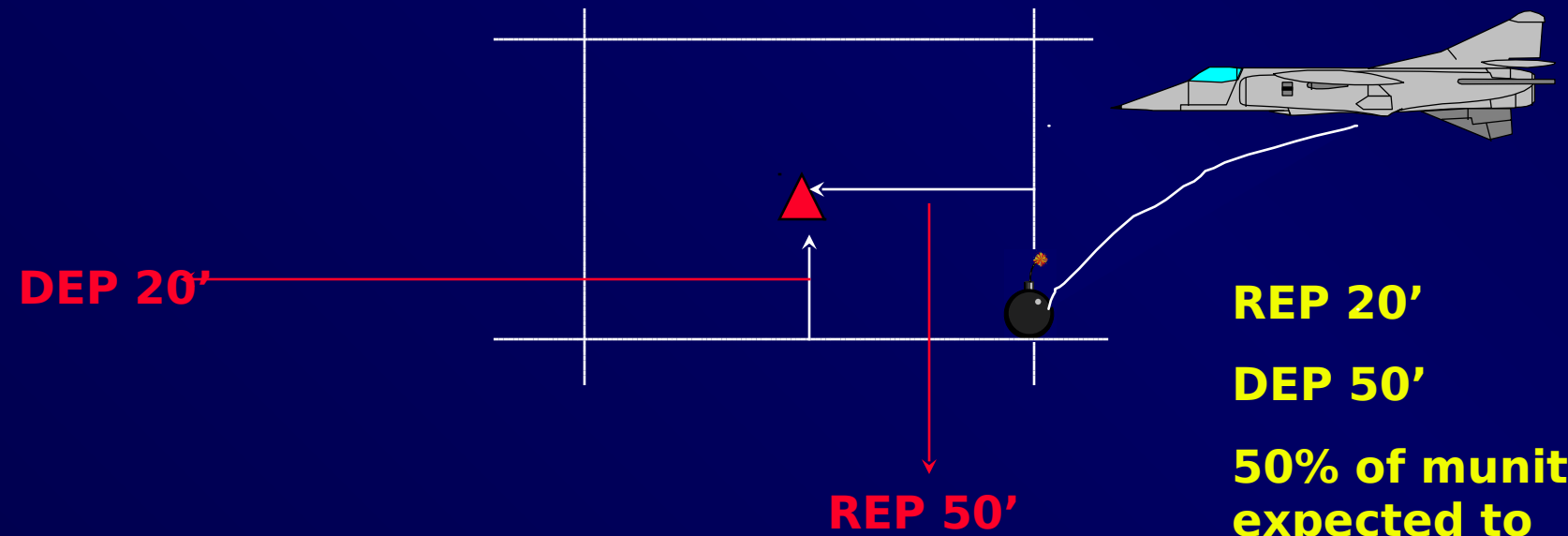
- JTF Guidance normally requires weaponeers to "weaponeer" to a 60% PD, but can be higher

WEAPONEERING
Error Types

- **HOW IS BOMBING ACCURACY MEASURED?**
  -Range Error Probable (REP)
  -Deflection Error Probable (DEP)
  -Circular Error Probable (CEP)

WEAPONEERING
REP & DEP

REP & DEP - The distances long and short/ right and left of a target which we can expect 50% of the munitions to fall

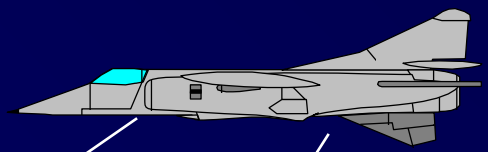


REP 20’

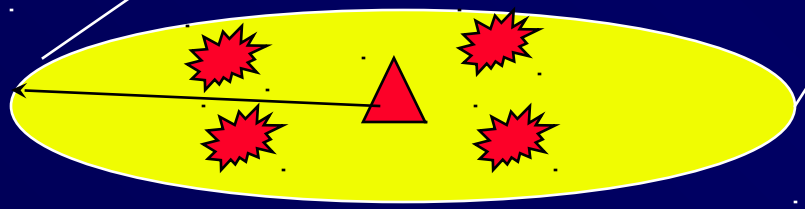
DEP 50’

50% of munitions expected to impact within

WEAPONEERING
CEP



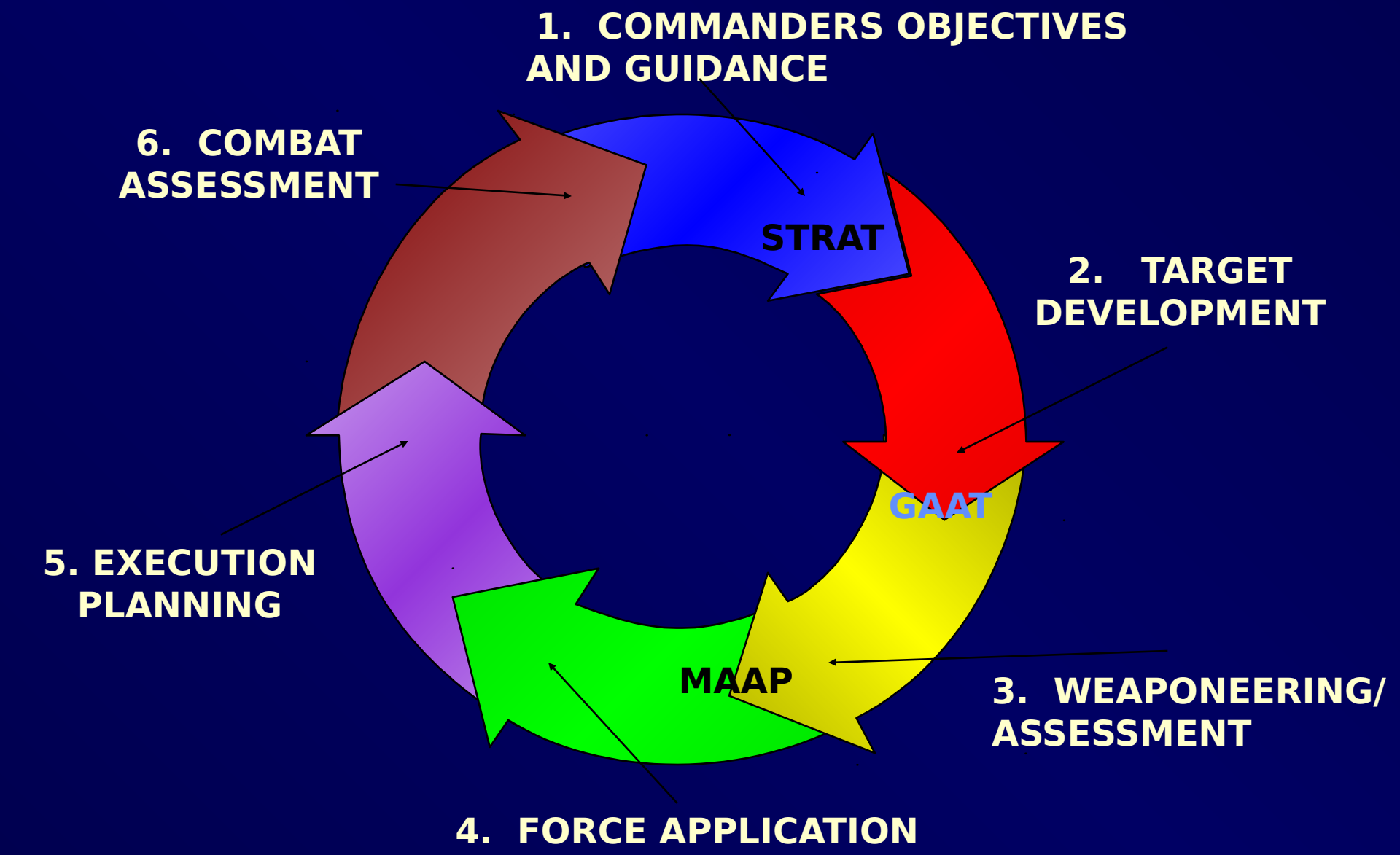
CEP - The radius of a circle centered on the aimpoint within which 50% of the weapons can be expected to impact



RECENT WEAPONS ISSUES

- **CLUSTER MUNITIONS**
  - APL EQUIVALENT?
  - REMNANTS OF WAR ISSUE
- **DEPLETED URANIUM**
  - THE ITALIAN IMBROGLIO
- **GATOR MINES**
  - TOUGH ON THE ALLIES
  - LIMITED USEFULNESS

TARGETING CYCLE



TARGETING PROCESS
Strategy

- **STRATEGY**
  - **- Strategy team will be given guidance from JFC**
  - **- JFACC mission and intent**
  - **- Develop objectives to meet intent**
  - **- JFACC approval**

- **JA Responsibilities**
  - **- Insure operation is being planned in accordance with ROE and international law**
  - **- You have to be there to know!**

TARGETING PROCESS GAAT

- **GAAT**
  - **- Reviews objectives developed by STRAT**
  - **- Targets nominated to meet each objective**
  - **- Draft prioritized target list created for JTCB**

- **JA RESPONSIBILITIES**
  - **- Review targets**
  - **- - LOAC considerations to include potential collateral damage issues for each target**

TARGETING PROCESS MAAP

- **MAAP**

  - JIPTL approved from JTCB

  - Targets are weaponeered and assets assigned against them

- **JA RESPONSIBILITIES**

  - Assess collateral damage on those targets identified during GAAT that may have a high potential for collateral damage

COLLATERAL DAMAGE ASSESSMENT

- **NATO Standard**

- **US Standard**
  - **Tier System**

COLLATERAL DAMAGE ASSESSMENT

NATO STANDARD

- **Catagorized by Distance**
  - **Low - No Non-military Targets Inside of 500 Meters**
  - **Medium - No Non Military Targets Closer Than 250 Meters but Inside of 500 Meters**
  - **High - Non-military Targets Within 250 Meters**

COLLATERAL DAMAGE ASSESSMENT

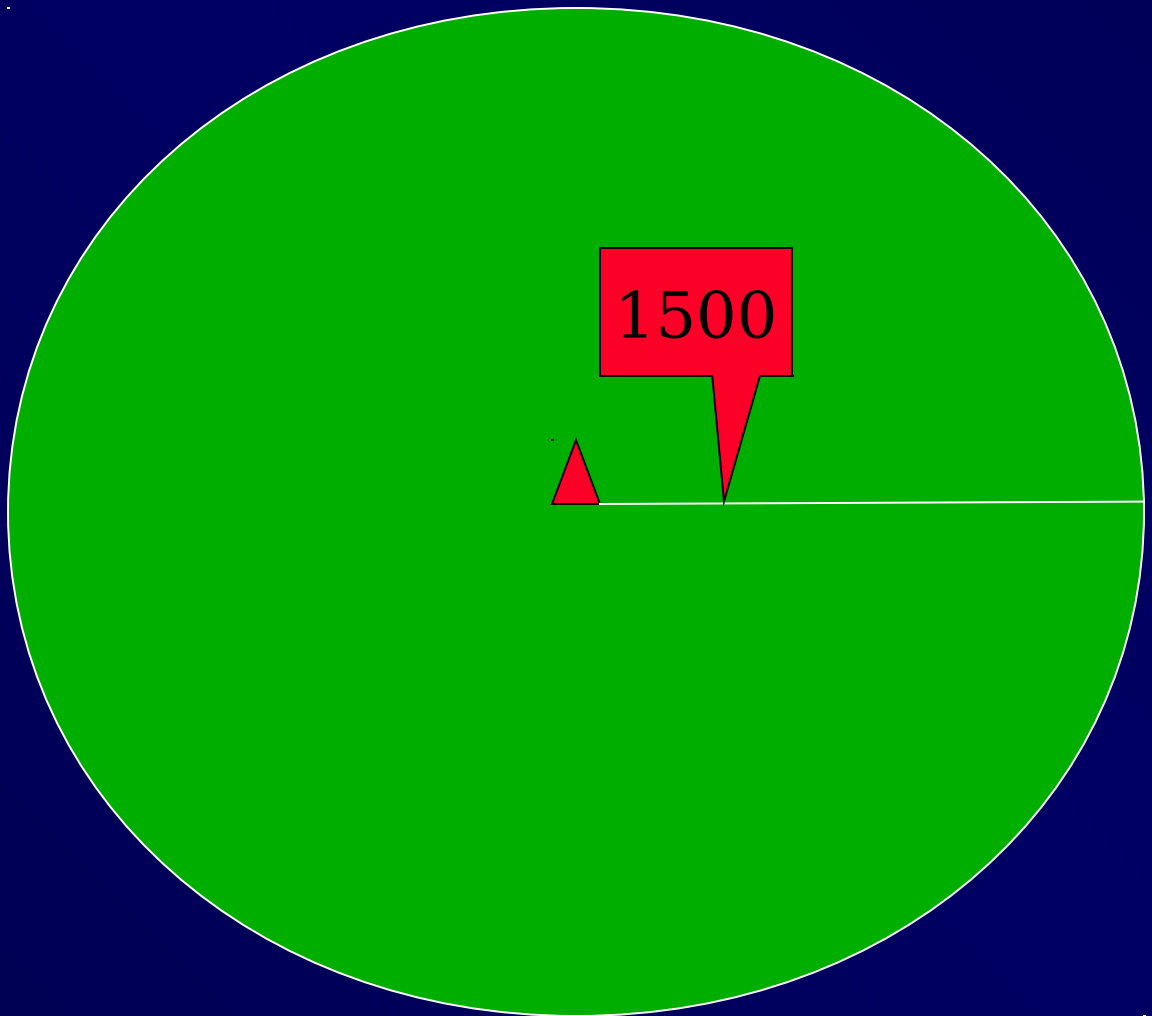
US STANDARD

- **JCS J2 Developed Tier 1 - 4 System**
- **First known attempt to standardize a method to assess collateral damage**

COLLATERAL DAMAGE ASSESSMENT

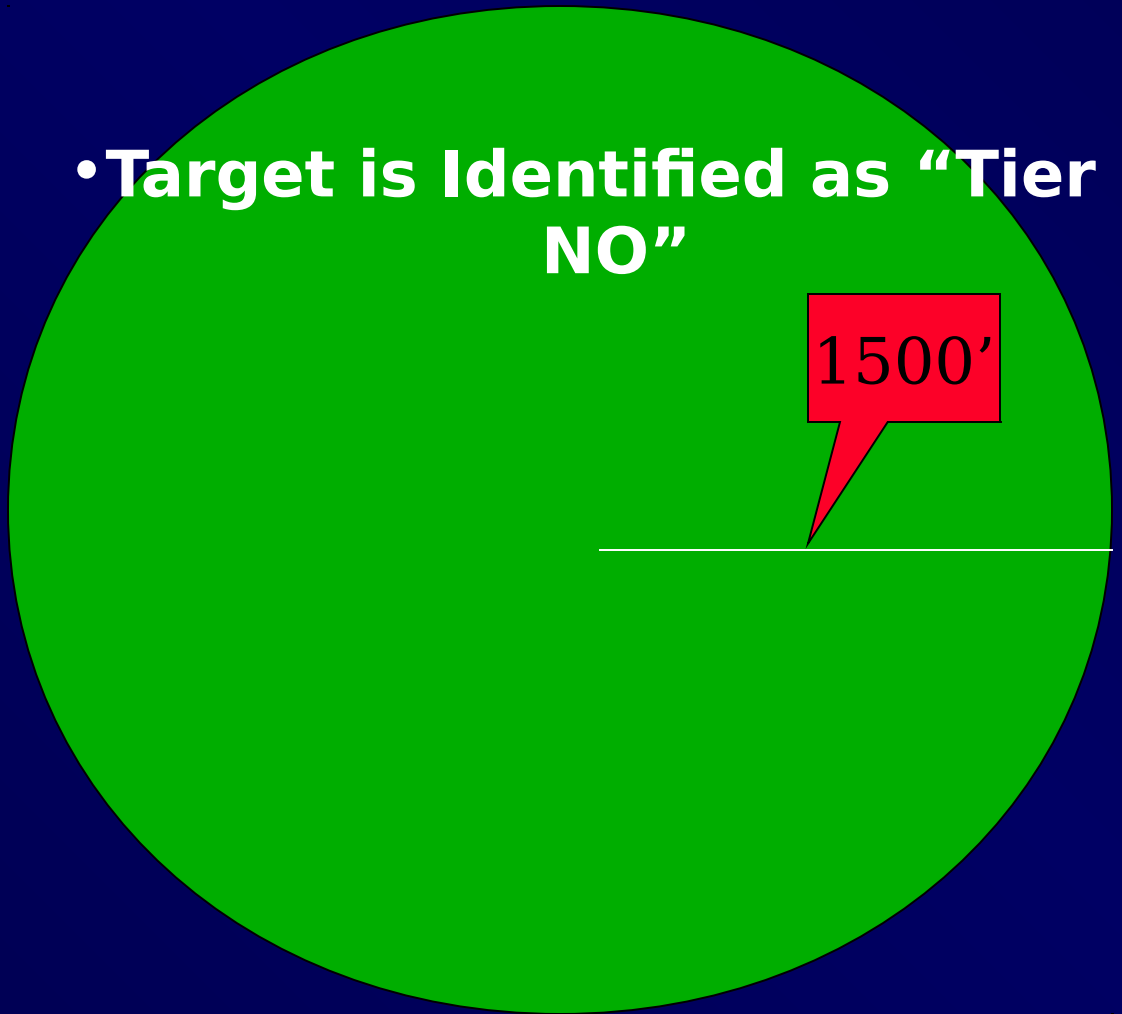
- **Calculated by Munition Effectivness Factors**
  - **CEP (99%)**
  - **Maximum Frag-flyout Distances**

TIER I ASSESSMENT

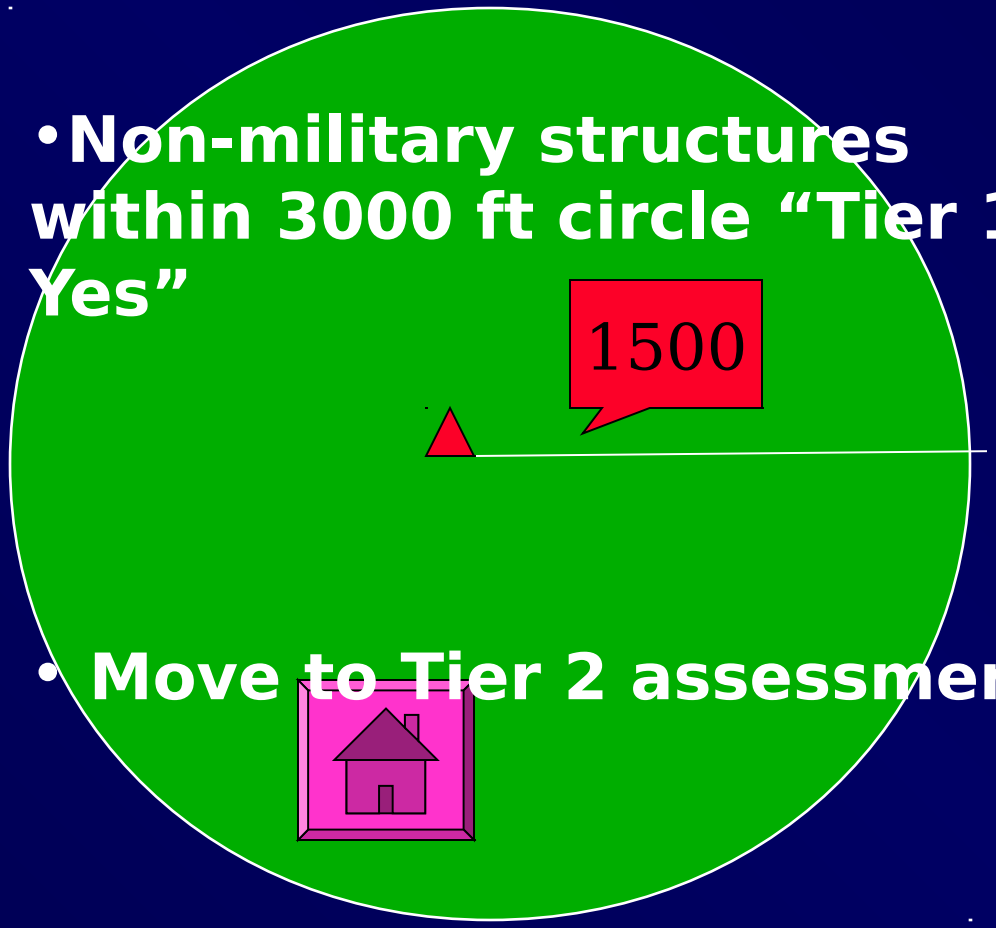


TIER I ASSESSMENT

- Target is Identified as “Tier 1 NO”



TIER I ASSESSMENT



- Non-military structures within 3000 ft circle “Tier 1 Yes”
- Move to Tier 2 assessment

TIER II ASSESSMENT

- First look at what type of munition is weaponeered for target
- Classified table that provides CEP and frag-flyout distances used for measurements

TIER II ASSESSMENT

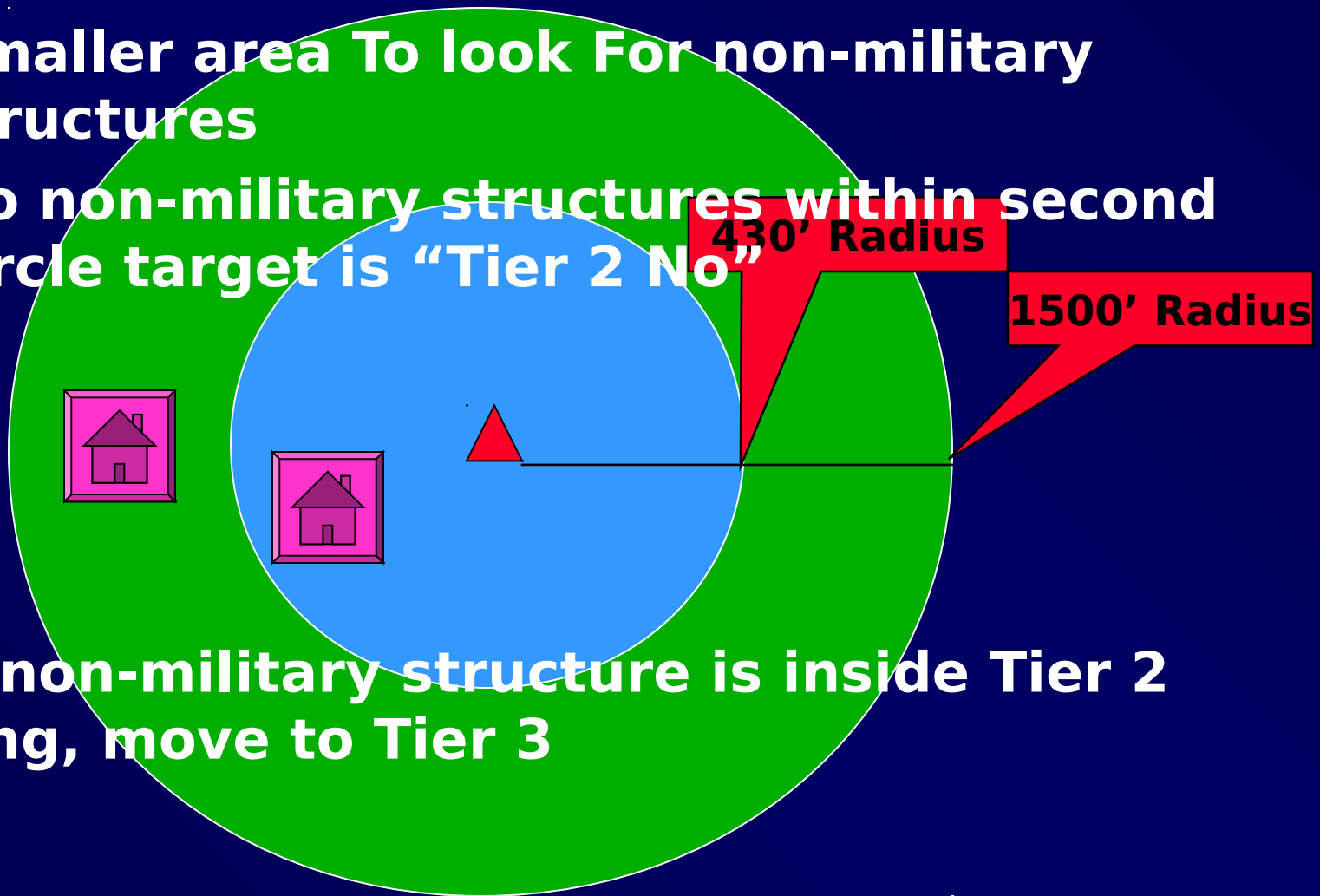
- **GBU-10 (EXAMPLE NUMBERS)**
  - **CEP =10ft (3 Sigma 3 x 10 for 99% CEP)**
  - **FRAG FLYOUT = 400ft**

30 + 400 = 430ft RADIUS

860ft DIAMETER

TIER II ASSESSMENT

- Smaller area To look For non-military structures
- No non-military structures within second circle target is “Tier 2 No”



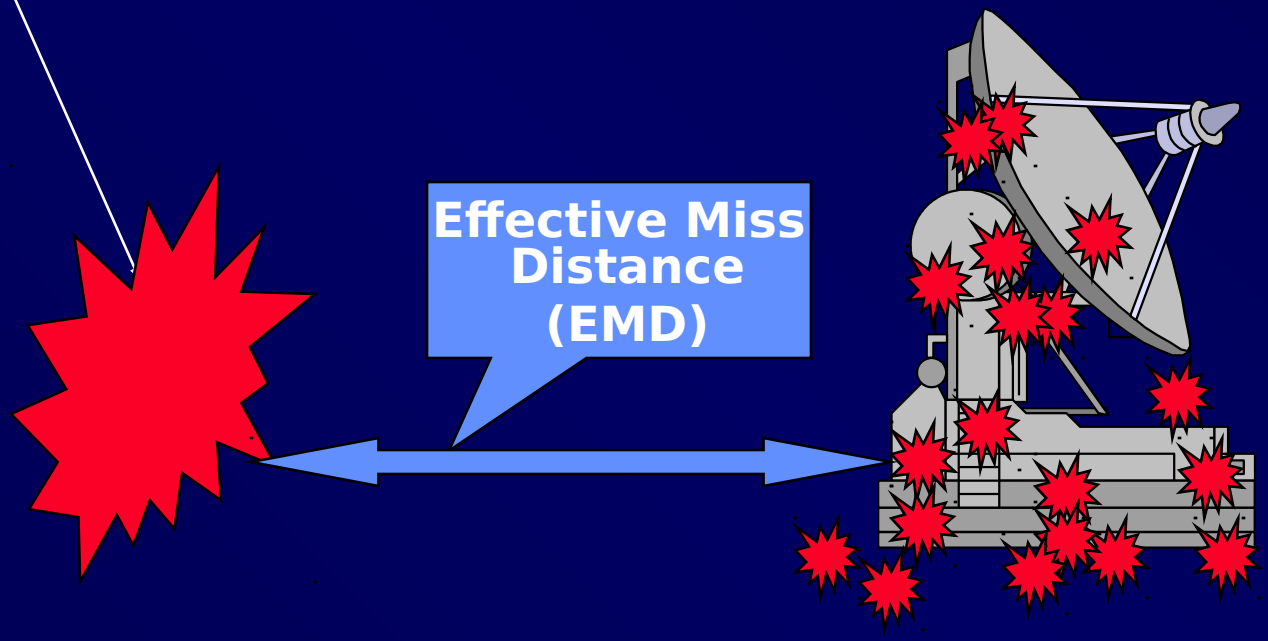
- If non-military structure is inside Tier 2 ring, move to Tier 3

TIER III ASSESSMENT

- **Assessment completed by using the Effective Miss Distance (EMD) of the munitions**
- **JMEMs Calculation**

TIER 3 ASSESSMENT

How far can the munition miss the DMPI and still meet its objective = EMD data



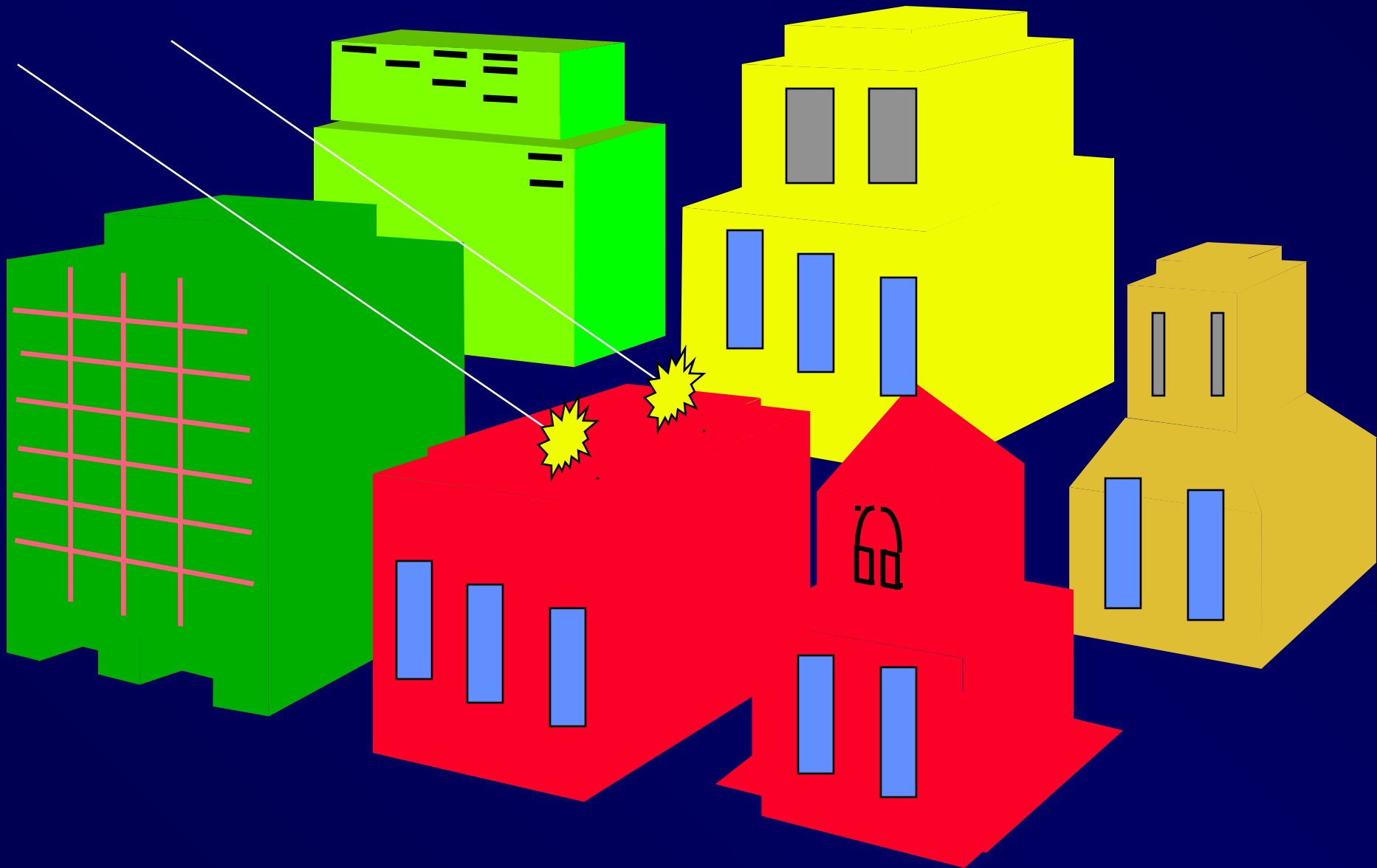
TIER 3 ASSESSMENT

Now use EMD data to determine extent of collateral damage to nearest object of concern. Tier 3Yes or Tier 3No

TIER IV ASSESSMENT

- Tier 4 assessments are currently done by the Joint Warfare Analysis Center (JWAC)
- Computer system that models buildings around the target
- Provides commanders a clear picture as to what level of damage is to be expected
  - Ear Drum Rupture
  - Panel Collapse
  - Skin Penetration
  - Glass Breakage

TIER IV ASSESSMENT



RECENT TARGETING ISSUES

- **DUAL USE TARGETING?**
  - ELECTRICAL GRID
  - TELECOMS
- **CRONY TARGETS?**
- **TRADE-OFF BETWEEN CIVILIAN DEATHS AND MILITARY CASUALTIES?**
- **NO-COST AIR WARS?**

QUESTIONS?